

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2014 series

5070 CHEMISTRY

5070/21

Paper 2 (Theory), maximum raw mark 75

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Page 2	Mark Scheme	Syllabus	Paper
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- A1 (a) (i)** C / carbon / Si / silicon (1) [1]
- (ii) N / nitrogen (1) [1]
- (iii) K / potassium (1) [1]
- (iv) N / nitrogen (1) [1]
- (v) C / carbon (1) [1]
- (vi) Zn / zinc (1) [1]
- (b)** $4\text{K} + \text{O}_2 \rightarrow 2\text{K}_2\text{O}$ (1) [1]
- (c)** aluminium forms an oxide layer (1)
- layer is unreactive / layer cannot be easily removed from the surface / layer adheres to (metal) surface / layer is impermeable to water (1) [2]

[Total: 9]

Page 3	Mark Scheme	Syllabus	Paper
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- A2 (a) (i)** values between 1.6 and 2.6 (1)
(actual value = 2.15) [1]
- (ii)** values between –130 and – 80 (1)
(actual value = –107) [1]
- (b) (i)** arrangement: is random/irregular (1)
motion: rapid/fast/can move anywhere/random (1) [2]
- (ii)** any suitable use e.g. in steelmaking/in light bulbs/welding (1) [1]
- (c)** completely filled outer shells of electrons/not able to gain electrons/not able to lose electrons/not able to share electrons (1) [1]
- (d)** $3\text{XeF}_4 + 6\text{H}_2\text{O} \rightarrow \text{Xe} + 2\text{XeO}_3 + 12\text{HF}$ (1) [1]
- (e) ANY THREE FROM**
- air liquefied (1)
- temperature of liquefied air raised (gradually)/liquid air is heated (1)
- gas with lowest boiling point vaporises first (1)
- idea of fractionation depending on difference in boiling points (1)
- idea of fractionation depending differences in size (or mass) of the atoms or molecules (1) [3]

[Total: 10]

Page 4	Mark Scheme	Syllabus	Paper
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- A3 (a)** chromatography paper dipping into labelled solvent in a beaker (1)
- solvent level below the spots at start of experiment/below base line drawn / below marked spot (1) [2]
- (b) (i) B and E (1) [1]**
- (ii) 0.68 to 0.72 (1) [1]**
- (c) (i) to make the spots visible / because the spots may not be coloured (1) [1]**
- (ii) (light) blue precipitate (1)**
- (dark) blue solution in excess (1) [2]
- (iii) $\text{Cu}^{2+}(\text{aq}) + 2\text{OH}^{-}(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s})$**
- correct formulae (1)
- correct state symbols (dependent on correct formulae) (1) [2]
- [Total: 9]**

Page 5	Mark Scheme	Syllabus	Paper
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- A4 (a) (i)** $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^- / \text{Zn} - 2\text{e}^- \rightarrow \text{Zn}^{2+}$ (1) [1]
- (ii)** in the copper/silver cell the copper is the negative electrode (1) [1]
- (iii)** silver and magnesium (1) [1]
- (iv)** magnesium
zinc
iron
tin
copper (1)
- the higher the voltage (difference between copper and the metal) the more reactive the metal / voltage (difference) gets smaller, the less reactive the metal (1) [2]
- (b) (i)** metal layers (1)
- slide over each other when force applied (1) [2]
- (ii)** electrons (originating from valency shell) can move / sea of electrons / some of the electrons are mobile / there are free electrons (1) [1]
- (c)** tin prevents oxygen and/or water from reaching the iron (1) [1]

[Total: 9]

Page 6	Mark Scheme	Syllabus	Paper
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- A5 (a) (i)** moles acid = $1.2 \times 10^{-3} / 0.0012$ mol (1) [1]
- (ii)** moles OH⁻ ions = $2.4 \times 10^{-3} / 0.0024$ mol (1) [1]
- (iii)** sulfuric (acid) (no mark but if incorrect 0, marks for question)
- mole ratio of acid to OH⁻ is 1:2 so the acid must have 2H⁺ per mole/only way to get 1:1 ratio of H⁺ to OH⁻ from 1:2 ratio of acid to OH⁻ (1) [1]
- (b) (i)** $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ (1) [1]
- (ii)** $24 / (2 \times 60) = 0.2 \text{ cm}^3 / \text{s}$ (1) [1]
- (iii)** ethanoic acid dissociates only slightly/ethanoic acid partially dissociated/hydrochloric acid dissociated fully (1)
- lower concentration of H⁺ ions in ethanoic acid **OR** reverse argument (1)
- lower frequency of collisions (with CaCO₃) in ethanoic acid **OR** reverse argument (1) [3]

[Total: 8]

Page 7	Mark Scheme	Syllabus	Paper
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B6 (a) (i) silicon dioxide is giant covalent structure/has a continuous structure of covalent bonds all linked in 3-dimensions (1)

all bonds are strong/all bonds need high temperature to break/all bonds need a lot of energy to break (1)

poly(ethene) has weak forces between the molecules/weak intermolecular forces (1)

not much energy required to overcome weak forces/weak forces easily broken/small amount of energy required to separate molecules (1) [4]

(b) addition (polymerisation) (1) [1]

(c) hydrocarbon because contains carbon and hydrogen only/contains carbon and hydrogen and no other element (1)

unsaturated because it has a (C=C) double bond (1) [2]



(e)

C	H	Si	Cl	
1.55	4.65	0.775	1.55	(1)
C ₂ H ₆ SiCl ₂				(1)

[2]

[Total: 10]

Page 8	Mark Scheme	Syllabus	Paper
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B7 (a) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ (1) [1]

(b) (i) respiration releases CO_2 **AND** photosynthesis absorbs CO_2 (1)
The (rate of) CO_2 released into the atmosphere is (roughly) the same as the amount absorbed from the atmosphere (1) [2]

(ii) gas which absorbs infra-red radiation / gas which absorbs energy / gas which absorbs heat (1) [1]

(iii) waste gas from animals / rice paddy fields / bacterial action / landfill sites etc. (1) [1]

(iv) $(0.0014 \text{ dm}^3 \text{ in } 1000 \text{ dm}^3)$
and $0.0014 / 24 = 5.833 \times 10^{-5} \text{ mol } CH_4$ (1)
 $5.833 \times 10^{-5} \times 16 = 9.33 \times 10^{-4} \text{ g}$ (1) [2]

(c) (i) the oxygen in O_2 comes from the water / the oxygen in the oxygen molecule comes from the water (1) [1]

(ii) protons = 8 **AND** electrons = 8 (1)
neutrons = 10 (1) [2]

[Total: 10]

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B8 (a) $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$ (1) [1]

(b) (i) position of equilibrium shifts to the right (1)

in direction of smaller number of moles/in direction of smaller volume (1) [2]

(ii) position of equilibrium shifts to the left (1)

(forward) reaction is exothermic/reaction goes in direction of absorption of heat (1) [2]

(iii) increases rate of reaction/lowers activation energy/alternate reaction pathway (1)

less fuel used to heat the reaction/less fuel used for the process/a lower temperature can be used/less electricity used to maintain the temperature/need to use the energy for less time (to get same amount of product) (1) [2]

(c) (i) $2 \times \text{CaSO}_4 = 2 \times 136 = 272$ (1)

$(272/506) \times 100 = 53.8\%$ (1) [2]

(ii) ANY ONE FROM

money or energy wasted in transporting calcium sulfate which is not required (1)

money or energy wasted in transporting substance which is not a fertiliser (1)

waste of money or energy in spreading a substance which is not a fertiliser (onto the soil) (1)

calcium sulfate does not dissolve and so is left on the soil [1]

[Total:10]

Page 10	Mark Scheme	Syllabus	Paper
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- B9 (a) (i)** acidity caused by H^+ ions (1)
- H^+ ions consumed in the reaction/ H^+ ions used up in the reaction (1) [2]
- (ii)** orange/reddish-brown (1) [1]
- (iii)** ions or particles have more energy/move faster (1)
- more particles or ions have energy above the activation energy/more energetic collisions/more effective collisions/more successful collisions / more fruitful collisions (1) [2]
- (b)** $Br_2 + 2I^- \rightarrow I_2 + 2Br^-$ (1) [1]
- (c)** purple solution goes brown (1)
- iodide oxidised to iodine/iodine is brown (1) [2]
- (d)** aqueous bromine decolourised (1) [1]
- (e)** correct dot and cross diagram for bromine molecule (1) [1]
- [Total: 10]**